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ABSTRACT

The relationship of reporters, scientists, and the public is explored in this paper. Recent issues that have triggered a demand for a new kind of science writer are noted as including society's increased interest in health care, in problems of the environment, the ethics of genetic engineering, and other issues concerning the autonomy of the individual. The need for communication about science is discussed, as are considerations of the constraints on the media and on the scientists. The analysis concludes that science writers are faced with the role of the scientific reporter as investigator and advocate rather than just a mere communicator of facts and that they should meet this new role of critic. (MKM)

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Communicating Science: the Special Problems Of Reporting Scientific Enquiry in the ~~Media~~

A Background Paper

prepared by

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In the last quarter of the 20th century, we find the scientific enterprise operating in an ambience that is strikingly different from 30 years ago. Then science was probably at its peak of public support both psychological and financial. And the stream of exciting discoveries that poured forth from the disciplines of physics and molecular biology seemed to crystallise and symbolise the power of an enterprise were generally unquestioned. This was the time of heroes and heroics. The media reflected the tone and the public loved scientists. So it was, in the late 1950s, that C.P. Snow could write in his famous book, The Two Cultures, that the scientists were the men who had the future in their bones, few voices were raised in dissent, that of the Cambridge critic, F.R. Levis, being the most notable exception.

But in 1979 the scientists are just as likely to be cast as villains as heroes; they are blamed - or their enterprise and technology is - for many of our ills. These range from the spoiling of the environment to assaults on our human autonomy by psycho-surgery or genetic engineering. To use the words of the culture critic of The New York Times, Mr. John Leonard, not only have they apparently caused us to lose our souls; they have demonstrated that they had no souls in the first place. Their political constituency has, in these days of active social change, widened to include a far greater number of people than ever before, who are insisting not only in re-negotiating the social contract with which science has been accustomed to operate vis-a-vis society, but in taking an active part in the direction and future trends of science. Given this the task of the communicator of science is more urgent, more responsible and possibly more difficult than ever before. There is another factor in addition: two separate things are happening in and around science simultaneously. First, exciting discoveries

are constantly being made as they were in the fifties and sixties. These can be expected to continue. But society's new interest in health care, or in problems of the environment, or in the dangers of recombinant DNA, or the ethics of genetic engineering, now overshadow the basic science and provide a second element which the media are quite properly reflecting. These new "trans-scientific" issues - to use physicist Alvin Weinberg's term - have accordingly triggered a demand for a new kind of science writer. The problems generated by society's new interests, coming as they do in a period of gross cynicism about governments, professional élites, other cultures, pose new challenges both to the scientist and to the science writer. There is a challenge to the scientist because these issues bring his enterprise into an area of controversy and its practitioners into the political arena - into that is, dynamic and fluid situations where there are not, or ever can be, single experiments which give definitive answers in the form of irrefutable facts or water-tight conclusions. The writer, too, is being forced to develop, unconsciously or consciously, new sensitivities about scientific judgement and reliability, and also new criteria about whose views and judgements to cover. In addition, they are struggling with the question of role definition - a question which was highlighted in 1972, at a conference sponsored by the Astor Foundation at the University of Sussex, on Science and the Media, in which the whole question of the scientific reporter as investigator and advocate, rather than just a mere communicator of facts, was the central issue. The conference was called shortly after the investigations of the English Sunday Times on the whole issue of the drug, thalidomide, and these investigations were ultimately to focus on the problem: who is responsible for this tragedy, the scientist, the drug-companies, governments, doctors, - or who?

Why Communicate at all?

Why communicate at all? Some answers are obvious. Science is a great human activity and a vital part of our culture. Failure to communicate it would be as absurd as a corresponding failure to communicate in literature and painting. Science affects us all in a variety of ways: the intellectual excitement it provokes, the changing perception of ourselves that it causes, and the practical benefits or disasters that its application brings. These are the traditional reasons to communicate science, but in our contemporary situation there are other reasons too..

We have seen that the relationship between science and the media should ideally be one of mutual interaction, in which elements of responsibility, accountability and determining patterns for social change are imperatives for both parties. The problems that these imperatives raise are both continuous and changing, and though it may not at first sight seem obvious, scientists and journalists share not only an attitude toward the truth, but also a commitment to change. On the one hand, the commitment is to changing ideas which will give us a better knowledge of the Universe and a more realistic perception of our place within it; on the other, it is to social change. Thus the reasons for communicating and popularising science span a whole spectrum from the values of education and culture to those of politics and entertainment. In addition, even if it were not true that more and more people desire to be involved in decision-making processes, it would still be essential in a democratic society for them to be so involved. The scale of scientific discoveries, especially in the area of biomedical research, now makes such involvement inevitable, oversight by the public essential, and examination of the long-term social consequences vital. For in terms of both the gross budgets for research and development and the dramatic upsurge in the absolute number of people professionally engaged in scientific research during the past twenty-five years, growth is very real. So debate follows

inevitably.

Of course, not everybody feels that oversight of science should be in public hands, but enough people do, and anyway it is the philosophy on which a democratic society is predicated. To achieve this oversight calls for the examination of several things: the immediate impact of scientific discoveries and the general consequences of science; the social and human influence of scientific discoveries; and the long-term consequences of the resulting technologies. For the special role of certain technologies - computer storage of personal data, for example - in ensuring authoritarian power in a state is vitally significant, as is the role of the bureaucracy - in any society whatever - in securing that same power. So unless we see and appreciate the effects of technology or bureaucracy, we become politically and socially blind. In fact, we blindfold ourselves from influencing directly the kinds of social structures that will determine our lives in the future.

Yet, although political and social policy in science and technology is of vital public interest, the element of public understanding and public involvement with science has remained slight. It is interesting to ask why? I myself conclude that it is not because it is difficult to understand the scientific and technological issues involved - as opposed to the detailed theories - for the questions are not ones of scientific complexity. Nor are the problems and solutions all that esoteric. If they were, then the role of the media could be more clearly defined and easier, for then television, radio, newspapers, and the schools could help by taking a more didactic and explanatory role. The real difficulty is of another kind. It has to do with uncertainty - uncertainty associated with research and innovation and their impact on real life.

For real-life issues are much more ambiguous and divergent than the immediate results of a scientific experiment. The divergence comes in the changing context of problems and their solutions, in the varied opinions of

experts, and in the possible mechanism of action. Such complexities will always be difficult for anyone to handle, whether in the media, science or politics, because there will always be differing opinions about cost-benefit ratios, social values, and the human aspects of life; and traditional analyses cannot provide answers which will be totally valid.

So one question immediately comes up, and it takes us directly into the role and function of the media: How can we separate out the various influences in every situation? Technology assessment, for example, is affected by interest groups which alone may have the expert knowledge for implementation or the cash for lobbying. But because of the existence and influence of special-interest groups, whether it is the Atomic Industrial Forum on the one hand, or Friends of the Earth, or ad hoc citizen's groups, we need organised counter-groups. We must have, that is, a mechanism for providing independent assessment of what the special-interest groups are doing which will give us ways and means of displaying and evaluating alternative solutions to particular problems. Moreover, we need to have ways and means of laying bare the different value systems that are held by the advocates of any particular course of action, and this should be one role of the media.

To take but one example of inadequate public information and therefore inadequate public involvement, consider the British- French Concorde aeroplane (SST) and the decisions in Britain and France in the early 1960s on whether or not to continue with the project. In retrospect, British citizens look at this situation and wonder how their government got away with it, for in the early years of Concorde, the multiple aspects mentioned in the previous paragraph were present. The political assessment of the technology was influenced by different interest-groups whose advocates applied at least five different value systems to the debate. These were, to paraphrase briefly: "We mustn't offend the French; we must continue to provide employment in the

British aerospace industries; we must maintain the prestige of the aerospace industries of both countries; there will be an indirect industrial spin-off of high value; the cost of going on will be no greater than the cost of cancelling." Similarly, we have seen comparable values surface in the debates preceding the agricultural revolutions initiated in the Third World countries. Though these changes would be wasteful, perhaps, they would also be technically sweet and enthusiastic innovators do not always take into account either the actual requirements of the users of the technology or its human effects. So whatever the syndrome - the Concorde, space, oil, nuclear energy, the industrial applications of recombinant DNA - it arises naturally from the special interests of particular parties, and the public must insist that these interests be balanced by open public debate.

The media come in squarely at this point - but with what specific role? One famous American journalist has said that the primary job of the newspaperman is to find out what is really going on and raise hell. I'm not so sure. We have to decide whether raising hell for the sake of raising hell is responsible, and indeed, whether it is always necessary, right, or proper to raise hell. A measure of the media's responsibility and judgement may be the way they themselves approach this question. Perhaps the media's role was much more aptly defined by Rod McCleish on the CBS-TV news recently when he commented on the death of a famous newspaper, The Chicago Daily News. He asked what we should expect a newspaper to do for us and answered that, like a friend, it should, gently or fiercely, point out to us things that we would prefer not to know about ourselves.

We know that communication is basic, whether for large-scale decision-making or for small-scale personal choices. We also know that the rationale for insisting on this communication is our belief that no one - neither the scientist, nor the political planners of science, nor the politician - alone knows best, or alone should make the decisions. But this does raise questions

about the obligations of the media to all parties, questions that may bring out different responses in Europe and the United States, and questions whose ramifications have not been completely explored.

First, we may ask, is it really the function of the media to provide public debate? One feels strongly that it is certainly not the function of the media to pass on, mindlessly and neutrally, statements by whoever can guarantee you a sale or whoever is in power, or whoever is most vocal, as the American newspapers did in the days of Joseph R. McCarthy, when so much of what the Senator said was published without comment or dissent. There has to be selection, and in passing, we must notice that in deciding what to popularize, the media may and often do impose their own views of science on the public. But there surely also has to be some analysis, and there has not been too much of that in America. But over and above this, another question has, I think, now come to the fore: should the members of the media provide the pre-requisites for debate, that is, the thorough, independent assessment that we have been discussing in the case of technologies? And where they manifestly do <u>not</u> do this, should the scientific profession set up institutions and organisations to this end? Because if it is not the media's job to promote or assist with these two roles of analysis and debate, then whose job is it, and how can the existence and values of interest-groups be highlighted and made explicit?

There are inevitably great divergencies over this question. At one end of the spectrum are the frankly sceptical, those who say that the public cannot exercise any kind of judgement at all, because not only are its members not well informed - they <u>cannot</u> be well informed. So matters must be left to experts - so no debate, therefore involvement of the media is not necessary. At the other end of the spectrum are those who consider such an attitude both élitist and defeatist. Moreover, traditional decision-making - whether in science or in politics - has always been surrounded by secrecy. The facts and the

rationale on which decisions are made do not get through, so the role of the press in ferreting these out is vital. If in Britain a strong advocacy role is played by the press, it is a very necessary counter-weight to the prevalent attitudes in Whitehall concerning the low level of the public's intelligence and competence when it comes to the formation of any policy - scientific or otherwise. It also counter-balances a long tradition of secrecy in decision-making through which it is hard to break, the issue of challenging which, consecutive Cabinets have evaded. It is probably no accident that Britain and Switzerland, we may notice, have had nothing like the open discussions over recombinant DNA and genetic engineering that have been so prominent on the American scene in the past few years.

But whether or not it is the function of the media to provoke public debate with all the necessary background information, it certainly is the function of the media to expose the existence of interest groups. In the same way that the value of the universities has been to lay bare and challenge fossilised ideas, and thus provide one means of breaking through the rigidity of professional institutions, so too, the media should challenge the automatic acceptance of expert's values. The media can, that is, provide the mechanism whereby we, the public, can trade off the judgements made by other people.

Dr. John Ziman, H.H. Wills Professor of Physics at Bristol University, in a radio broadcast, "Seeing through our Seers", (The Listener, June 24th 1976) summed it up in these words:

> "It is the wisdom of the pluralistic society to doubt the competence of any authority to choose wisely on behalf of every citizen. It is not so much that they cannot be trusted not to feather their own nests; it is simply that the questions debated within such organisations are seldom correctly posed.

> They refer far too much to what is technically possible or technically optimal, rather than what is socially desirable. This is perfectly exemplified by the history of the Concorde project, where the advisory committee seems to have been dominated by engineers and accountants, rather than by potential passengers or by non-passengers residing near large airports...
>
> The proper antidote to the poison of 'technocracy' is something like 'participatory democracy' .... The fundamental problems of the unequal distribution of education, experience and responsibility amongst the voters of a democratic society are ever with us. But I do not believe that we should regard the underlying issues of technological development as inaccessible to the layman who is prepared to take the trouble to inform himself about them.
>
> In this process of education and self-education, the popularising journalist plays a very important part. His job is to bridge the cognitive gap from the side of the layman .... the popularisation of science in the mass media is of immense social value. The good technical journalist can acquaint himself with the essential expert opinions and draw attention to the most significant features of a complex argument. If he really knows his stuff, he can distinguish between genuine expertise and bogus authority...."

Yet as Ziman points out, one walks a tightrope. There are dangers, of course, in relying upon the journalist. Unlike the physician who feeds on the favour of those who buy his words, and thus plays to their desire for safety and certainty, the journalist tends to fall into the opposite temptation of discovering disquieting features and viewing with alarm. Competition for public attention may spoil his judgement. What he tells us is interesting,

often highly instructive, but not altogether to be trusted in our search for understanding and decision. Which brings us to the next problem.

The Constraints:

To say that scientists and journalists share a common aim in their respective spheres - the public expression of the truth - is, of course, to state an absolute ideal. Various constraints, operating on both professions, tend to create conditions which make this highly laudable aim about as abstract as Newton's definition of a body in absolute motion. Who indeed has ever seen a moving body in such condition? When in history have we been in a situation when either profession could operate without constraint? The constraints arise partly from special interests, partly from external pressures and partly from professional ethics. Both the media and the scientists must live with constraints but actually they are so different that one can easily stand the situation on its head and argue that there is such a fundamental disparity between the environment of the journalist and the scientist that the task of each coming to terms with the other is well nigh impossible. And when achievements fall short of expectations, or when disenchantements come to be mutual, an examination of the causes generally reveals that it is not venality, or spite, that has given rise to the situation, but rather the separate constraints on each party.

We will examine these in turn.

The Media (i) The Printed Word.

There have been many assessments of what role a journalist sees himself playing. One of the most useful for us is that given by the late Nicholas Tomalin, a famous reporter from The Sunday Times (London), who was killed in 1973 on the Syrian front during the last Arab-Israeli conflict. It is worth quoting because it contains both the essence of the job and of the dilemma.

> "To say that a journalist's job is to record facts is like saying that an architect's job is to lay bricks. True, but missing the point. A journalist's real function - at any rate his required talent - is the creation of interest. A good journalist takes a dull, or a specialist situation, and makes readers want to know more about it. By doing so he both sells newspapers and educates people. It is a noble, dignified and useful calling."

Tomalin was a man who was part of a great tradition of investigative reporting for The Sunday Times. In the same way that Berstein and Woodward investigated the Watergate affair, so The Sunday Times' Insight teams delved into scandals such as thalidomide, the drug that led to the birth of numerous malformed infants in 1959 - 1962, and "Rachmanism", the outrageous rent abuse system in London associated with one Mr. Rachman, and the case of Donald Crowhurst, a yachtsman who, while pretending to be taking part in a single-handed yacht race around the world, was actually sailing in a triangle somewhere in the South Atlantic. But the crux of the problem so far as our present discussion is concerned lies in Tomalin's phrase, "the creation of interest". For there are intense market pressures to sell newspapers and then to sell more. Added to this, the surge of populism then the need to create interest can lead, oh,so easily, to something else. For the more that the media become mass media, the greater is the tendency not to give facts, or to create interest, but promote sensation.. Now certainly from time to time there are new scientific discoveries which positively spill over with interest, so that all the reporter has to do is simply record them. The discovery of a new and important vaccine, or the successful landing of a man on the moon, contain enough excitement by themselves for the news to be self-propelling. But generally it is not like that at all. As

Dr. Norton Zinder, a geneticist at Rockefeller University, has said, science is "... always complex and seldom simple." Thus the need to create the interest to sell the newspapers may conflict with the proper standards of science reporting. This is one constraint.

In addition, there are two other problems which make it extremely hard for scientific ideas to get the kind of careful attention and in-depth treatment they properly require. The first has to do with the method, or structure, of the newspaper report. The British critic and novelist, Cyril Connolly, spoke of literature as the art of writing that which will be read twice, whereas journalism is the art of writing that which will be grasped at once. Scientists must completely understand this fact, and also that the press not only may be uninterested in dealing with anything long term and continuing, but they are in fact not set up to do so. This is also true of television. Consider the way any news story is structured. The principle is this: you can cut off the last paragraph of a news story and still have the story; then you can cut off the next-to-lastparagraph and still have the story; you can keep on cutting right to the top - to the headline - and in one following line you could - in theory - still have the story. That is <u>basic</u> journalism. But that is not the way <u>scientific</u> journalism can work, and here journalists are pulled in two directions. In telling a story about science, the first job is to start by building a series of bridges between the reader's understanding and your own. If any one of these is cut out, the whole story collapses, so one must build bridge after bridge until finally an understandable conclusion is reached. A standard newspaper story is exactly turned around. You give the conclusion in the headline and the subhead, and these are slowly developed with more and more detail until the last paragraph. So here is the second constraint, built right into the structure of the way information is conveyed by the media.

The third constraint, also built-in, also true of television, is the problem of newness - that is, the temptation, even the need, to find out the "new" all the time. This constrain probably explains - just as much as does the desire to expose conspiracies, or deflate the experts, or sell by sensationalism - why such topics as Laetrile and cloning and bending spoons have been given the massive coverage they have. They are new phenomena, they are interesting, and they are immediate. The stories are used initially because they are sensational, so they help to sell newspapers (and attract audiences). Collected all together, they make an impact and a running issue - or sore - depending on who you are and what you choose to look at. But eventually a topic goes away and is completely forgotten; so forgotten that when the truth behind the sensational story, such as the bending-spoon phenomenon, is finally explained, it may get no coverage at all.

Yet another factor tending to place constraints on science reporters and newspaper and magazine editors is rather more subtle and to my mind much more insidious. It has to do with the pressure of fashion. It takes a sophisticated and balanced science reporter or news editor, to be aware of the existence of fashion and to guard against it. We all have images of each other which we would like to be widely accepted. We all have images of ourselves which we want to be preserved. (This is true of scientists and journalists equally.) If in earlier years the "fashion" in science reporting coincided with the image of the immaculate scientist, with his pure and undefiled concepts, with "Gee-Whiz" skills twirled on the point of a Sir Lancelot's lance, all being wonder and heroics, now the situation is completely reversed - and just as mythical. Dr. Frankenstein, along with Machiavelli, is back in fashion and so the image of the good scientist has been replaced. Certainly one aim of the reporting game is demystification, and a very good thing, too. But where scandals patently do not exist, one wonders whether the reporter sees it as his job to go out and create them. Daniel Greenberg, editor and publisher of

Science and Government Report, writing on the aftermath of recombinant DNA in The New England Journal of Medicine.(November 24, 1977, p.1188) said,

> "And in the nirvana of contemporary science writing, nothing is accorded greater honour than revelation of suppression in the pure world of science. Small stuff, compared with Watergate, admittedly, but surely better than anything yet turned up on the relatively scandal-free scientific community. In fact, the earliest public meetings on recombinant DNA research came at the height of the Watergate revelations, and it will be assumed that some of the now-regret-ridden advocates of openness were inspired by the squalor of Watergate to insist on doing business in the open".

To insist on doing business in the open is a very good thing. But if, as Greenberg believes, the greatest honors in scientific reporting will now go to scientific analogs of Bernstein and Woodward, it is possible that fashion rather than fact is dictating the thrust and impetus of the journalist's coverage. In this situation it is difficult to know who is pulling whom; which is the chicken and which the egg. So disenchanted is the public with political promises and political processes, and with the self-interest of professional groups, that it is more than willing to go along with current fashion. This is now necessary, according to Greenberg, not to sell more of the product or scoop the rival, but because therein the laurels of the profession are to to found.

This attitude came out strikingly in the kid-glove treatment which both Dr. Bill Summerlin and Mr. David Rorvik were given by the media in comparison with the "established" scientists involved in the episodes. Some may consider that this is merely a fair swing of the pendulum, and

that the hushed and reverential tones in which the scientific heroes of yore were treated had to have its reaction sometime, someplace. But it is tough luck on those who are honestly trying to do their scientific jobs, and appallingly bad both for the public communication of science and for society in its need to understand scientific processes and scientific ideas fully and genuinely - that is, to understand what the profession is currently up to and what are the implications of its work.

Finally, there is the constraint caused by the sheer pressure of time and the haste of the event. There is a significant danger in cutting corners. Far too much reliance is placed, it now appears, on "authorities" - those spokesmen for science who may be self-appointed, or who by virtue of being Nobel laureates, or heads of institutions, have this distinction thrust upon them. As shown by a recent study ("Scientists in The Popular Press"), Shepard and Goode, The New Scientist, 24th November 1977, the scientific research enterprise as portrayed in the media, has a significant pecking order. It is presumed that the higher in the hierarchy a person is, the more he knows. If you want an eminent quote, such a person is worth significantly more than somebody working lower down, even though the latter may be doing all the research and knows infinitely more about the subject. As the authors point out, the path to becoming a publicly recognised marijuana expert seems to be unrelated either to doing research on the subject, or to writing on the subject in those scientific and medical journals that other scientists consider significant enough to cite. It does appear, however, to be related to two other factors: being the head of a health-related agency say, or being known in a number of areas tangentially related to the subject. For example, being a physician makes one an instant expert on drug use. In a similar study, Dr. Ray Goodell of MIT found a not dissimilar pattern: there is a group of scientific "experts" whose views are commonly sought on a wide range

of scientific matters simply because for a variety of reasons they have been exposed to the press and their names are known. The authors of The New Scientist study ask, "Does this matter, for this is an anomaly which is clearly not present when reporters write about athletics or novelists?" Well, yes it does matter, because it tends to make the scientific process and scientific knowledge more authoritarian than it is, and scientific communication more divorced from the real practice of the enterprise than is either real or necessary or good for us.

I have for the moment ignored the whole issue of science on television. In view of the sponsorship of this conference, this may be considered very undiplomatic of me, but I too am suffering under a constraint: that of time. At this moment all I will say is that in the medium of television the problems and the constraints which I have listed here are amplified and exaggerated several times over.

The Scientists:

The constraints acting on scientists are of two kinds: those that are imposed by the very nature of science and scientific methodology, and thos that have been acquired during the evolution of the profession. Not only do many scientists have an ambivalent attitude toward public communication in general, but they have an antagonistic, even primitive, attitude towards the popularisation of science at all. "Popularisation" in their minds translates literally to the French "haute vulgarisation". Too many people in the scientific community either translate the word literally or use the alternative meaning, "coarsening", believing that the process demeans both the person who undertakes it and the content of what is communicated. Since in the eyes of their colleagues, "demeaning" science is precisely what they are suspected of doing, and so high are the professional stakes in the contemporary career race that it simply isn't worth the risk.

For disapproval can operate not only on young scientists but at all levels and it can take all forms. An examination of the origins of this attitude would make a splendid Ph.D thesis for someone. I think the factors would be found to be varied, over and above the sense of lack of urgency about the need for popularisation: these are the increasingly introverted natures of the profession as it has evolved; a competitive career structure where an initial reputation for scientific "soundness" is the very first thing to cultivate and cling to; soundness here being equated with orthodoxy - a scholarly community increasingly separated from the body politic; a consequent loss of professional and personal responsibility for the impact of one's work on society, a loss that may be transmuted into an abdication of moral responsibility, for if there be a higher allegiance, it is not to society but to the profession or the discipline. Note that many of these attitudes are not unique to the scientific profession, but are shared by scholars in other disciplines and by members of other professions also, being just a part of the total social picture today.

It is sometimes argued that scientists' distrust of popularisation is merely a very proper distaste for those who seek and get more public exposure than their work deserves. But I am not convinced. Basically, journalists cannot be fooled forever. They will ride along for a while, but they eventually become sensitized to self-promoters. I think the reason for the distrust is a little more primitive: academics are sometimes singularly uncharitable about each other and often extremely unfair. Any serious writer feels this situation deeply and it is a constraint. For unless you are totally unscrupulous and feel that all is fair game, and that all should hang out, you work with one hand tied behind your back. Because it simply is not fair to prejudice someone's career - if that is what it amounts to - just to publish your own book. That said, the onus and

responsibility is, of course, a dual one, calling for judgement and balance on both the writer and scientist. We writers in turn can rightly ask for charity - not for ourselves, for we can protect ourselves, but for those whose work has intrigued us, or which we feel has a genuine interest to a wider audience.

If one feels one's sympathy rapidly waning over this constraint, one is well-nigh overflowing with sympathy over the other constraints - those that are imposed by the very nature of science and the scientific process. These will be familiar to any scientist, but can be briefly illustrated by the following familiar anecdote. Early in this century, the city of New York was debating whether or not to allow the horseless carriage to invade its streets. There were many arguments for and against, and one such was advanced by Dr. James Walsh, a distinguished physiologist, as reported in The New York Times on January 7, 1900:

> "Insects have their favorite places for laying eggs. These places are carefully chosen. The butterfly may seem to circle around and alight on any flower; as a matter of fact she goes to one particular flower. These things are never the result of chance. Now, it is a scientific fact that the common housefly lays her eggs in horse manure. In this the eggs flourish prodigiously. With the horse off our streets, the flys must follow him. It will not be where the horse is not. Thus a serious channel of infection will be done away with and many lives will be spared. The horseless carriage will greatly reduce the death rate in cities".

Dear Dr. Walsh. How could he have been expected to foresee either the rise in numbers of pet dogs, or the increase in speed and number of horseless carriages? The phrase "scientific facts have shown", has often led even the best scientists wildly astray. The great British physicist Ernest Rutherford's remark that

"no practical use would ever come out of splitting the atom" is well known; it was Sir Richard Woolley, the former Astronomer Royal, who described planetary travel as "utter bilge". More recently, Sir Macfarlane Burnett who shared the Nobel Prize with Sir Peter Medawar for his work in immunology, has argued very cogently that, "no practical value has ever come from molecular research, nor will there be any". It has happened before, and it will surely happen again.

These are cautionary tales indeed, but the germ of our problem is also here. So much in and around science is tentative. It is often impossible to state fully, or anticipate fully, the short-term, let alone the long-term practical consequences of science. Facts do not always stand up; theories do not always beat the burden put upon them; statistics will be revealing or misleading, and initially it is difficult to be certain which; ideas have to be modified; conclusions must be qualified; preliminary data are very vulnerable, and so, too, are the scientists who possess them; opinions among scientists vary greatly as to what has been established and what has not; science progresses not in a straight line, but in a path not unlike that of an inebriated spider - there is a direction of sorts, but many diversions; perspective is essential, both historical and scientific. All these add up to a mercurial situation - a sum of conditions which can drive even the most responsible journalist to despair.

Thus we can see how it is that many of the mistakes made in science reporting originate from both sides. They arise from the professional conditions imposed on both parties and come about by the actions of those people who have been tempted to skip accepted procedures. They come from the scientist who inflates himself with the authority of the "expert", offers his data and speculations as if they were engraved on the tablets of the law, and from the foolish reporter who believes him. Or they come from the amoral reporter on a "quickie" journal, who has extrapolated a statement or a scientific situation almost out of sight, aided and abetted by a scientist who is in a hurry.

What has to be reconciled is the vulnerability of the preliminary data of science, and its tentativeness, with the journalist's need for speed and hard news. But how?

Conclusion:

Perhaps present circumstances and new imperatives possibly do require a new group of people outside the scientific profession looking toward it. The new role which has been created by the circumstances and social ambience in which science now operates dictates this, as well as the very nature of that scientific work which increasingly impinges on the autonomy of the individual. This new role has been recognised by such people as Dr. Lew Thomas who, at the Rochester Conference spoke of the need for a "highly professional, analytic, meditative scrutiny of how the work is done; why, whether good or bad or trivial, and what is its inner meaning" It is not, Thomas pointed out, the same job as the daily reporting of science. It is much more the role played by a Walter Lippmann in politics, an F.R.Leavis (a famous British critic) in English literatire, and a Donald Tovey, an equally famous music critic. It is, in fact, I insist, "a critic" in the accepted, old-fashioned meaning of the term.

Now we have long been used to having critics in other professions: music, literature, and the various other arts. They have, when they served honourably, played a vital role in interpreting, mediating and mirroring both the activity and the products.

But to accept - as I think we ought - Lewis Thomas's suggestion for science would demand great responsibility from those who would undertake this critical task. For a critic's role has its own temptations: to expose, to do a hatchet job for the sake of doing a hatchet job, or to become so narcissistic that the end and the object become one's own ideas rather than those of the enterprise under review. These tempations are

very real and have to be strongly resisted. Equally, it would be, and will be, extremely difficult for the scientific profession to accept either the need for such critics or their existence. Yet to my mind there is a crucial humility in Lewis's Thomas's suggestion which if implemented could be extremely valuable - but only insofar as the scientific profession came to trust that the critics did a fair job and the critics felt the profession was open with them.

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